

Appendix B

List of Experts Solicited for Peer Review & Comments from Peer Reviewers

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Peer Reviewer Comments on "Status review of Xantus's Murrelet: report to the California Fish and Game Commission (October 21, 2003 draft)"

Prepared by Harry R. Carter (10 November 2003)

General

This review seems to be thorough and reflects appropriate scientific considerations and treatment of most available information on this species. As indicated below, various corrections and caveats should be included to clarify various points in the text. Listing of the Xantus's Murrelet as threatened under CESA appears to be reasonably well justified with this report, despite incomplete information on the species and its status. While some island populations are increasing or will increase over the next two decades (e.g., Anacapa and Los Coronados), the major U.S./California colony at Santa Barbara Island is declining and requires substantial long-term management action for restoration. Much additional effort also is needed to determine the status of murrelets, to examine the significance of threats, and to develop restoration plans at many colonies in California and Mexico. Without listing, restoration and research/monitoring efforts will continue to be severely hampered by competition with other agency needs, insufficient cooperation, and insufficient funding. Without much additional research, monitoring, restoration and management actions, U.S./California populations of this species probably will be lower in the future than they are today and these populations probably will be more susceptible to future extinction. I agree with the major conclusions of the report with the clarifications below.

Executive Summary

Page 1: 2) "decline of 30-72% from 1977 to 1991" has not been well established. Carter et al. (1992) indicated that about 30% lower numbers could be determined using the most comparable data. More recent work suggests a 14% decline from 1991 to 2001 (Whitworth et al. 2003). A decline of 72% from 1977 to 1991 would be more evident than available data indicates. A moderate approach may be to summarize as "decline of 14-30% or higher from 1977 to 1991".

Page 1: 3) Productivity of the Craveri's Murrelet and factors affecting breeding success have not been well studied, using standard methodology for comparison to Xantus's Murrelet.

Page 1: 6) Reduced breeding success also may have resulted in the past from lowered breeding success from organochlorine pollution between the 1940's and 1980's in the Southern California Bight, although such pollution appeared to be relatively low by 1992 (Carter et al. 2000).

Page 2, para 4, line 7: "...low reproductive rate, low juvenile survival, and high colony fidelity,..."

Page 2, para 4, line 10: "...to murrelet recovery, without immediate efforts to re-eradicate rats."

Page 2, para 6, line 3: "...1-2 eggs per clutch, although a replacement clutch can be laid if the first clutch is lost."

Page 2, para 7, line 4: Santa Barbara is the largest current colony in California but Anacapa Island may have been the largest colony in the past (McChesney et al. 2000) and may become the largest colony in the future.

Page 3, para 1, line 1: Historical data prior to the 1970's are incomplete and difficult to interpret

and murrelets may be more abundant today at some colonies than in the 1940's.

Page 3, para 1, line 5-7: A conservative rate of decline at Santa Barbara Island in 1977 to 1991 might be 14%, as shown from 1991 to 2001 using similar methods (Whitworth et al. 2003).

Earlier comparisons of population size are affected by use of different estimation techniques and may overestimate decline (Carter et al. 1992). Changes in occupancy over time may partly reflect redistribution (e.g., due to predation, disturbance, or loss of cover at bush sites) and may not reflect the true rate of decline.

Page 4, para 2: Bald Eagles are known to prey upon Xantus's Murrelets at Santa Catalina Island (D. Garcelon, pers. comm.). Reintroduction of eagles to the northern Channel Islands may lead to greater predation on Xantus's Murrelets.

Page 4, para 3, line 2: "... documented to cause temporary parent-chick separation..." I'm not aware of evidence that would prove that chicks die due to such separations. Chicks and adults have well developed vocal recognition by the time of colony departure. They probably find each other most or all of the time after short separations.

Page 4, para 5, line 9: Egg neglect probably is not linearly related to prey availability. Most egg neglect occurs after laying of the second egg and before incubation begins. Murrelets likely reduce egg neglect during incubation by adjusting their foraging behavior if prey are less available.

Very low prey availability may result in a lower percentage of breeding adults that lay eggs or a higher rate of clutch abandonment, rather than higher egg neglect.

Status Review

Page 3, para 1, line 1: Average life span of many alcids is over ten years (Gaston and Jones 1998).

Page 3, para 1, line 2: "...1-2 eggs per clutch"

Page 3, para 1, line 6: The Ancient Murrelet is a congeneric species but Craveri's Murrelet is most closely related to Xantus's Murrelet within this genus. Previously, Craveri's and Xantus's Murrelets were included in the genus *Endomychura*.

Page 4, para 1, line 6: "...every two to four days..."

Page 4, para 6: The congeneric Japanese Murrelet (*S. wumizusume*) also should be mentioned here. This endangered species has a small population size, restricted range, and many similar threats in Japan.

Page 5, para 3: Perhaps also cite Springer et al. 1993

Page 5, para 4, line 15-17: Suggest delete "...supporting the hypothesis that non-random mating is occurring (Jehl and Bond 1975). The low proportion of intermediate plumage types is further evidence that some isolating mechanisms are present". There are other hypotheses that can explain this and this is a small point.

Page 5, para 5, line 6: Change "(D. Whitworth, pers. comm.)" to "(H. Carter, unpubl. data)".

Page 6, para 2, line 5: Numbers of breeding Xantus's Murrelets at Anacapa Island may have been equal to or larger than Santa Barbara Island in the past (McChesney et al. 2000).

Page 7, para 5, lines 1-2: Delete "This species was discovered breeding on Los Coronados Islands, Mexico, by A. Van Rossem April 17, 1908". Egg records at Los Coronados extend back to about 1893 from other collectors. Reword following sentence to "A few years ago [about 1908] they were very rare [at Los Coronados Islands], but at present ...".

Page 8, para 1, line 3: Need to add the caveat that "It is quite likely that egg collectors were

becoming more familiar with what time of year and in what habitats to find murrelet eggs at the Los Coronados, Santa Barbara, and Anacapa Islands such that true population increase may not have been occurring at this time.”

Page 8, para 3, line 4-6: Statements like “common” and fairly common” may reflect their higher relative abundance in the Southern California Bight compared with northern California. Historical declines in the early twentieth century likely occurred at Los Coronados Islands, Santa Barbara Island and Anacapa Island due to introduced cats and rats. Hunt et al. (1979, 1980) suggest some increase from early century to the mid 1970's at Santa Barbara Island due to the control and removal of feral cats. Some increase also has likely occurred at the Los Coronados Islands after removal of cats. However, murrelet population size at all three islands are likely depressed well below their historical carrying capacities.

Page 10, para 1, line 11: Suggest replace “Most wildlife populations...” with “Many seabird populations...” for greater clarity. It does not matter what mammal populations might do here.

Page 10, para 2, line 15-16: Suggest reword to: “In 1991, auklets persisted in small numbers on the offshore islet of Sutil Island near the southwest end of Santa Barbara Island and in bluffs at Elephant Seal Point (Carter et al. 1992). Recently, auklets have not been found at either location and may no longer breed at Santa Barbara Island (J. Adams and P. Martin, pers. comm.).

Vegetation and soil changes from non-native grazing mammals and past agricultural practices likely led to a large historical decline with no chance for natural recovery.”

Page 11, para 2, line 6: Perhaps check Drost and Fellers 1991 and Drost 1989? (Thesis) about vegetation changes potentially causing or contributing to high mouse densities at Santa Barbara Island.

Page 11, para 3, line 7: Could add the caveat that “It is very unlikely that Xantus’s Murrelets were extirpated but their population was likely reduced and limited to habitats with low cat predation.”

Page 11, para 4, line 5: Suggest reword to: “A slight recovery of murrelets may have occurred” No data to show an actual increase.

Page 12, para 1, line 1: Suggest reword to: “Carter et al. (1992) surveys were undertaken in an effort to assess murrelet population size in 1991 but methods probably were only roughly comparable to those used earlier by Hunt et al. (1979, 1980). It is difficult to assess exactly how comparable these methods were due to poor description of count methodology used in the 1970s (Carter et al. 1992).”

Page 12, para 2, line 2: Suggest reword to: “... made some adjustments to the occupancy correction factors used in 1991 (note: these adjustments may or may not be valid), and derived a smaller number of breeding birds than Carter et al. (1992; Table 1).”

Page 12, para 2, lines 4-16: Suggest delete after “Specifically, ..” to end of paragraph. These details are not really important to discuss here and it could take even more space to go into this issue in full detail. There are many different ways to calculate and apply occupancy factors, it is not clear what definitions and procedures have been used by different researchers, and there has been insufficient discussion between researchers to resolve many issues.

Page 12, para 5, line 2-3: Suggest change to: “... the petition (HSU, unpubl. data; National Park Service (NPS), unpubl. data).” USGS-BRD does not have any unpublished data on changes in

numbers of nests or occupancy at Santa Barbara Island. However, they have assisted a recent HSU study.

Page 13, para 2, line 6: Murray et al. 1983 is the main citation for the 6,000-10,000 estimate.

Page 13, para 4, line 4-5: Suggest reword to "...that is contained in both reports. However, techniques to estimate population size were different, estimates may not be fully comparable, inter-annual variation may be involved, and earlier techniques were not well described (Carter et al. 1992). We agree with Carter et al. (1992) that the at-sea work ...". The main objective of the Carter work was not to compare to the Hunt work but to merely determine the best population estimate for 1991 that was possible with available past information and personnel, time, effort, and funds in 1991. A secondary objective was to compare our estimate with earlier estimates and discuss possible trends. For Xantus's Murrelets at Santa Barbara Island, it was difficult to determine trends for the many reasons noted but Carter et al. (1992) felt that the 1991 survey at least established that murrelet population size was closer to the lower end of the range of 1970's estimates and may reflect decline. More recent work has tended to confirm continued decline after 1991 which has led me more recently to consider that much of the difference of numbers between the 1970's and 1991 estimate was due to decline, even though methods were different.

Page 14, para 3, line 3: Suggest reword to: "...This intensive effort to monitor breeding success provides an important data set to help assess population status, as noted in the petition." Measuring occupancy was not an original goal of the murrelet monitoring program. If it had been, data would have been collected differently.

Page 15, para 2, line 7: Productivity for Craveri's Murrelet has not yet been determined using standard techniques with adequate sample sizes. Check DeWeese and Anderson to see if they used only rough numbers that are not directly comparable to Xantus's Murrelet. Contact Tershy to find out what his citation was based upon. Need to clarify what Craveri's numbers mean.

Page 15, para 4, line 1: Suggest reword to: "Recent work in the Channel Islands by HSU researchers ..." USGS-BRD staff have assisted HSU researchers (along with several other agencies and groups) but HSU has led this study.

Page 16, para 2, line 5: Suggest change to: "...and showed 14% lower numbers of active nests.....".

Page 16, para 2, 8: Some degree of rat control also occurred in several years during the 1980's through NPS efforts.

Page 16, para 4, line 7: Suggest reword to: "..., since egg collecting was a form of scientific investigation and hobby during that era." Much valuable scientific information has been gleaned from egg collections over the years.

Page 18, para 1, line 3: The amount of suitable breeding habitat, numbers of rats or cats, amount of predation, and the percentage of habitat accessible to rats or cats has not been effectively determined at any island, making it difficult to determine potential carrying capacity or the degree of population reduction.

Page 18, para 2, line 3: Suggest reword to: "This is supported by recent research indicating substantial suitable but unused habitat, evidence of rat predation on murrelet eggs in accessible and relatively inaccessible habitats, and past evidence of larger numbers of murrelets at Anacapa Island (McChesney et al. 2000, Whitworth et al. 2003; H. Carter, pers. comm.)."

Page 18, para 4, line 5-6: I presume that Pitman's 10% estimate is based on various assumptions

that may or may not be true. I'm not aware of any detailed study that was conducted. Our recent work suggested that murrelets occurred in fairly large numbers at North and South Islands in 1995 and 2002. For such large numbers to be present shortly after cat removal, I think that cats did not greatly reduce murrelet numbers to 10% of original numbers. Instead, it appears that many murrelets were able to evade cat predation on parts of North and South Islands, probably by breeding in steep topography with limited cat access and having only a short period of daytime nest attendance. I do think that cats reduced murrelet numbers but not to such a great degree as Pitman.

Page 18, para 5, line 4-5: Reword to "Recent work was conducted by HSU and ICEG in spring 2002 at the San Benitos Islands (Table 2; Whitworth et al. 2003a)."

Page 18, para 5, line 6-7: I am not aware of any colony extirpation of Xantus's Murrelets. They were thought to have been extirpated at Todos Santos, San Martin and San Geronimo but 1999 surveys found small numbers still present that had apparently gone undetected (Keitt 2000).

Page 18, para 5, line 10: Murrelets have never been documented to nest at Natividad, San Roque, or Asuncion so they may never have bred there.

Page 19, para 2, line 1: Suggest reword to: "In spring 2002, HSU researchers noted hundreds of murrelets present in the waters around the Coronados while conducting spotlight surveys (H. Carter & D. Whitworth, unpubl. data). Some recovery may have occurred after cat removal but these large numbers also indicated that the population was not severely reduced. If concerted". USGS-BRD provided some funding to HSU to conduct this work but USGS-BRD did not conduct the work.

Page 19, para 6, line 3: Suggest reword to: "...in difficult terrain. Comparison of two rough annual population estimates without error estimates is not alone sufficient to firmly establish population trends. However, lower numbers found through this comparison were consistent with other information that suggested that decline might be occurring (Carter et al. 1992).

Additionally, since 1994, several new survey techniques have been utilized by HSU, including vocalization surveys, spotlight surveys, and ornithological radar surveys (Figures 11-18). These intensive studies have helped discover the full extent of the breeding distribution of the Xantus's Murrelet in the Channel Islands but newer methods have not provided data at Santa Barbara Island that were inconsistent with the 1991 estimate. The most current estimate for Santa Barbara Island (500-1,250 pairs; Figure 11) incorporates data from available sources during the 1991-2002 period, allowing for various rough adjustments. The Department is currently working ...".

Page 20, para 3, line 2: Suggest reword to: "...on only four island groups (Santa Barbara,..."

Page 20, paras 4-5: I think these statements apply to oceanic islands and birds that are island-endemic or can't fly between islands. These quotes don't really apply here.

Page 21, para 1, line 4: Xantus's Murrelets are well adapted to survive catastrophic breeding failure events due to variable prey availability in the California Current because they are long lived. They are unlikely to experience die offs due to low prey availability because they are generalist foragers over large areas. No die offs have been reported.

Page 21, para 3, line 6: Suggest reword to: "Though murrelets still exist at all known historical colonies, their numbers probably are greatly reduced from historic levels ...".

Page 21, para 4: Bald Eagles may become a problem, if their reintroduction to the Channel Islands is successful.

Page 21, para 5, line 4: Replace "(H.R. Carter, pers. comm.)" with "(Carter et al. 1992, 2001; McChesney et al. 1995)".

Page 22, para 1, line 4-5: Delete Santa Rosa and San Nicolas because no murrelet nesting has ever been known at these island groups. Little suitable habitat exists there and little fox-free habitat exists there.

Page 22, para 4: As noted earlier, egg neglect probably is not linearly related to prey availability. Most mouse predation occurs on the unattended first egg before the second egg is laid. This is not egg neglect. Eggs left unattended just after laying of the second egg are not really "neglected" because incubation has not actually begun. Little neglect occurs after incubation has begun because birds adjust their foraging and incubating bouts to reduce or prevent egg neglect. If prey availability is very low, birds may abandon incubation but this is not "egg neglect".

Page 24, para 3, line 4: Insert: "Seabird mortality from the 1969 Santa Barbara oil spill was not well investigated. However, coastal areas around Anacapa and Santa Cruz Islands were oiled in the January-May period when murrelets attend nocturnal at-sea congregations beside colonies. Some or many murrelets from these colonies probably were killed (Carter et al. 2000)."

Page 25, para 2, line 10: Need to add caveat that "However, no extensive and achievable plans exist for the extensive interagency cooperation needed to respond to an oil spill in the Channel Islands. Specific plans are needed for colony, at sea, and beached bird surveys to document impacts to murrelets, in the event of a spill."

Page 25, para 4: Suggest delete this quote due to inaccuracies. For example, flightless chicks disperse quickly from colony areas and adults are largely dispersed while foraging at sea during the breeding season (Whitworth et al. 2000), except for some localized concentrations such as off the south side of Anacapa Passage (Hamilton et al. 2003). Carter et al. (2000) pointed out that the biggest problem is oiling of murrelets in nocturnal at-sea congregations around breeding colonies.

Page 26, para 1, line 3-4: No Xantus's Murrelets were recovered dead or injured after the *American Trader* oil spill. Since few Xantus's Murrelets occur in this region of the Bight in winter, few if any murrelets probably were killed by this spill.

Page 27, para 1, line 11. Burrowing Owls have been observed killing Cassin's Auklets at night on the South Farallon Islands, just outside a lighted window of the researcher quarters (H. Carter, pers. comm.).

Page 28, paras 2-4: Their basic argument is that high owl predation occurs sporadically and is not substantial or regular enough to affect the population to a large degree over time. This argument cannot be easily dismissed before determining how many murrelets are actually killed over a series of years by owls and separating out the effect of artificial light on owl predation.

Page 29, para 3, line 6: Xantus's Murrelets tend to use shrubs on steep coastal slopes, not *Coreopsis* shrubs near grasslands further inland.

Page 31, para 4-5: No permanent parent-chick separation has been documented. Temporary separation at night may not result in mortality.

Page 33, para 2. Nelson (1987/89?; Condor) described effects of light levels on Cassin's Auklet nocturnal activity at the South Farallon Islands.

Page 35, para 4: Visitors wandering off trails and into murrelet nesting areas is not a big problem at Santa Barbara Island due to steep coastal slopes and cliffs. However, park visitors do enter dry sea caves on occasion at Anacapa and Santa Cruz Islands where small numbers of murrelets and at times large numbers of Ashy Storm-Petrels nest. Nesting habitat in dry sea caves can be destroyed, eggs can be crushed, or adults disturbed by non-careful walking on ground and on driftwood in sea caves.

Page 36, para 2, line 8: Decline in Cassin's Auklets at the South Farallon Islands may also be related to high gull predation (Carter et al. 1992).

Page 36, para 5, line 5: Add "...and Lewis 1995; H. Carter, unpubl. data)."

Page 37, para 2: When did the Navy eradicate all rats and cats at San Clemente Island? Have they prevented their reintroduction?

Page 37, para 3: An important caveat to add is that past assessments of low impacts were based on limited knowledge of past activities during a period of low testing on the Sea Test Range and results from a radio telemetry study in 1995-97 (Whitworth et al. 2000). All future activities need to be carefully scrutinized for possible impacts on Xantus's Murrelets, especially if tests increase in frequency or magnitude at or near the water surface.

Page 38, para 2, line 7. Change to Carter and Sealy 1984 and fix lit cited.

Page 38, para 2, line 9. Add Carter et al. 2002 for Japanese Murrelet.

Page 39, para 5, line 9: Add Carter et al. 2002 for Japanese Murrelet mortality in gill nets near breeding colonies during the breeding season.

Page 39, para 1: Perhaps better to say that all identified threats have the potential for contributing to decline in murrelet populations. Bald Eagle predation should be added with Peregrine predation as an emerging threat.

Page 40, para 5, line 2: "...since at least 1985..."

Page 40, para 5, line 4: Suggest add: "...by NPS, but different study efforts need to be integrated into a large long-term monitoring effort and study."

Page 41, para 2, line 3: Suggest reword as: "... monitoring program has been reduced due to other demands on NPS resources and NPS has looked to the Department and other sources for funding support for murrelet monitoring."

Page 42, para 2, line 2: I'm not aware of this 1992 petition. Please provide more information about who submitted it and what was the logic presented for listing at that time.

Page 43, para 1, line 1-2: Delete "An example is the Sydeman et al. 1998 document that summarizes threats to the murrelet population." This project was funded by the National Biological Service (now the U.S. Geological Survey, Biological Resources Division).

Page 45, para 2: Other forms of California/U.S. protection not discussed are: National Marine Sanctuaries (Channel Islands, Monterey Bay, Gulf of the Farallones, Cordell Bank, Olympic Coast); Channel Islands National Park; U.S. Navy (San Miguel Island); Santa Catalina Island Conservancy; Nature Conservancy (Santa Cruz Island). Mexican and Canadian status and protection are not mentioned. Migratory Bird Treaty Act not mentioned.

Page 45, para 3: As mentioned earlier, these numbers need to be consistent throughout document.

Page 46, para 2: The world population size may be much smaller than currently thought, if only small numbers of murrelets occur at Guadalupe Island. Recent estimates are not available.

Page 46, para 2: The Coronados population likely is part of the same genetic metapopulation as the Channel Islands. While annual movements probably do not occur between the Coronados and Channel island populations, small amounts of movements likely do occur over time. Some recognition of the cross-border relationship of these colonies is needed.

Page 47, para 1, 5-6: As noted above, egg neglect does not really occur in this manner. Suggest reword to: "If prey availability is very low, murrelets may neglect their eggs on occasion. If prey availability is insufficient, murrelets may never incubate or may abandon their eggs. Whenever eggs are left unattended, they are subject to predation by mice or rats." Low prey resources (i.e., usually indirectly measured at a different time of year and different location) may not translate to low prey availability for murrelets in foraging areas used during breeding. Since all prey resources are not measured (i.e., murrelets feed upon many different types of prey which they can switch between), it is not currently possible to measure prey availability for murrelets.

Page 47, para 4: Significant amounts of nesting habitat probably has been removed at San Clemente Island (due to past Navy bombing of offshore rocks, current/continuing bombing of the south end of the island with bombing-related fires, and land development), at Santa Catalina Island (due to quarrying and land development), and at Prince Island off San Miguel (due to past Navy bombing). Habitat loss contributes to low numbers at these islands. Small habitat loss probably also has occurred at Anacapa and Santa Barbara Islands due to construction of NPS island facilities (wharfs, buildings, paths, etc.).

Page 48, para 4, line 2: Suggest reword to: "...Utilize vocalization surveys, spotlight surveys, and nest searches to develop preliminary population estimates ..."

Page 49, para 1, line 2-3: Suggest reword to: "A controlled experiment is needed to measure reproductive success of murrelets at Santa Barbara Island without mouse predation. For example, an enclosure could be established that would exclude mice but allow full access by murrelets. The results of this experiment would help separate the effects of mouse predation from other possible problems."

Page 49, para 3, line 2: Add NOAA to list.

Page 49, para 4: Educational materials will not be successful without enforcement.

Page 49, para 5: Suggest reword to: "...and plant associations should be greatly expanded to speed restoration which is currently occurring at an extremely slow rate. Monitoring, study and restoration of bushes used for murrelet nest sites also is needed..."

Page 50, para 8: Outreach is very vague. A cooperative U.S./California/Mexico program is needed for monitoring, studying, and restoring Xantus's Murrelets at the Los Coronados, Todos Santos, San Martin, and San Geronimo Islands. These four Mexican islands experience similar oceanographic and prey conditions as the Channel Islands (i.e., within the Southern California Bight), probably are part of the same metapopulation as the Channel Islands (at least the Coronados), and have the greatest exposure to human impacts in California (e.g., oil and organochlorine pollution) that can extend into Mexico. Some U.S./California funding is critical to developing such a cooperative program.

Page 50, para 4: Observer programs can be very expensive. It might not make sense to fund an observer program if these funds were available for other more important and less expensive actions.

Page 50, para 5: Should consider closures of squid fishing adjacent to all colonies in the Channel

Islands during the breeding and pre-breeding seasons (February-July). Special ornithological radar studies may be needed to establish where murrelets nest at certain islands to determine where closures are needed.

Page 50, para 7: Suggest reword to: “..to sea caves where murrelets nest on Anacapa and Santa Cruz Islands. Such closures need to be part of a larger management plan that also protects other sea caves at these islands where murrelets are not known to nest but which contain large nesting numbers of other sensitive seabird species (e.g., Ashy Storm-Petrels). Protection of sea caves for murrelets should not occur at the expense of other sensitive species.”

Page 50, para 10: Suggest reword to: “Murrelet nesting habitats must be protected from destruction and protected from human disturbance.”

Page 51, para 1: Suggest reword to: “Peregrine Falcon and Bald Eagle predation on murrelets has been little studied, indicating a need for more research in this area.”

Page 51, para 8: Direct habitat destruction probably has been a key factor affecting the small population size of murrelets at San Clemente and Prince Islands. Habitat restoration is needed at these locations to help make local population larger to avoid their future loss due to other factors.

Page 52, para 2: Artificial habitat (e.g. nest boxes) may be useful for facilitating monitoring in sea caves.

Page 54, para 1: If listing occurs in early 2004, suggest that the need for endangered species research permits be delayed for six months to allow sufficient time for researchers and agency personnel to prepare and approve permits, without hindering monitoring and research during the 2004 breeding season.

Tables

Table 2.

- The derivation of Carter estimates for California colonies have not been described in this report and are not available in any single source which could be cited. Suggest footnote with wording such as: “Carter’s unpublished estimates of numbers of breeding Xantus’s Murrelets in the Channel Islands, California, in this table and Figures 11-18 reflect rough ranges of possible breeding population estimates derived from various 1991-2002 survey data (i.e., ground-based surveys [Santa Barbara], vocalization surveys [all islands], spotlight surveys [Anacapa and Santa Barbara only], and nest searches in accessible areas [all islands]) and general habitat assessments, with rough adjustments. At most colonies, traditional survey techniques to estimate population size are not feasible and only rough population estimates are possible with available data (H.R. Carter, pers. comm.).
- Breeding at Santa Catalina can be considered confirmed based on radar detections of murrelets in 2000 (Hamer et al. 2003). Suggest remove asterisk.
- Breeding at Todos Santos and San Martin Islands can be considered confirmed based on vocalization surveys (Keitt 2000). Suggest remove asterisks.
- Suggest remove Pitman estimate for Los Coronados which applied to the late 1980's and early 1990's. Whitworth estimate applies to the 1995-2002 period.
- Footnote 2: Suggest delete. Carter et al. (1992) used previous Hunt et al. (1979, 1980) estimate of 150 breeding birds for 1991.

- Footnote 4: Suggest delete. Information from McChesney et al. (2000) is included in estimate provided (H. Carter, unpubl. data).
- Footnote 5: Suggest delete. Information from Carter et al. (1992) is included in estimate range provided (H. Carter, unpubl. data).
- Footnote 7: Suggest delete. Information provided in Carter et al. 1996, Keitt 2000, and Pitman are incorporated into the estimate provided (H. Carter and D. Whitworth, unpubl. data).

Figures

Figure 4.

- Suggest delete Santa Rosa, San Nicolas, Cedros, and Natividad to prevent confusion because murrelets have not been documented at these island groups.
- Suggest delete San Benito under legend for *scrippsi* and *hypoleucus* but include under both subspecies legend.

Figure 5.

- Spear et al. (2003) may show some greater use of the southwest area of Baja California than shown here but this is roughly correct.

Figure 10a.

- Details of how occupancy was calculated are not provided. Does this refer to occupancy of original 1985 nest sites, all previously-recorded nest sites (1985-2002), or all potential nest sites?

Figure 10b.

- Suggest delete. There are many types of possible statistical analyses to use on these data. This approach may not be best. Figure 10a is more informative and the degree of decline observed over time is evident without regression lines.

Figures 11-18.

- Note that all unpubl. data presented in these figures were provided by HSU. USGS helped prepare the figures.

Figure 19.

- Figure simplifies oil and ship traffic in Southern California Bight. Some passage of ships still occurs through Santa Barbara Channel and Navy ships enter Channel Islands Harbor (Port Hueneme).
- Figure omits oil, ship, and Navy traffic into San Diego which is important in relation to oil risks to Santa Catalina, San Clemente, Los Coronados, Todos Santos, San Martin, and San Geronimo colonies.

Figure 22.

- Figure omits information from other colonies. Squid fishing activity was high off Santa Catalina Island in 1994-99. Since 1999, fishing activity has been high off Santa Cruz and Santa Rosa Islands.

Figure 23.

- Owl roost numbers in 1999 and 2000 may have reflected accumulation of carcasses from prior years. Were old carcasses excluded?

6 November 2003

Sandra C. Morey, Chief
Habitat Conservation Planning Branch
California Department of Fish and Game
1416 Ninth Street
Sacramento, CA 95814

RE: Comments of the Draft Status Review of the Xantus' Murrelet

Dear Ms. Morey:

Below are my comments on the draft document "Status Review of the Xantus' Murrelet" prepared by the California Department of Fish and Game (CDFG). Thank you for the opportunity to review this important document.

First of all, I would like to commend CDFG for their excellent, sound, and complete summary of historic and current scientific information on the status of the Xantus' Murrelet in California. CDFG has provided a thorough review of the life history, distribution, abundance, and population trends of, and threats to, this species. I agree with CDFG's interpretation of the data and do not know of any data or publications that would alter the conclusions reached by CDFG. Therefore, I support CDFG's recommendation to the California Fish and Game Commission that the Xantus' Murrelet be listed as a threatened species.

It is especially important to emphasize, despite recent progress in the management of this species (e.g., eradication of rats and subsequent increased nesting success on Anacapa Island), that the murrelet's limited range, low population size, overall declining population trend, high predation rates (from native and non-native species), and many other threats at nest sites and within their foraging range, will limit their ability to recover in the short term (next 10-20 years). Therefore, it is imperative that the listing and associated management activities move forward quickly, and in an intensive and well-planned effort, to ensure the survival and recovery of this species. CDFG has mentioned these important points in various sections of the report, however more emphasis should be made in the conclusions section (Page 45) about the importance of the short term in preventing this species from becoming endangered or going extinct.

One of the biggest pieces that I found missing from the report was any discussion in the recommendations section (Pages 48-51) about dealing with the potential for oil spills. Oil pollution was determined to be a major threat (Pages 24-26) and identified as a threat of such importance that it could merit listing the species as endangered (Page 53). Concrete steps should

be outlined that address minimization of the risks of oil spills, including but not limited to: (1) studying and identifying the potential risks of oil pollution to the murrelet population; (2) developing a detailed plan to address the risks of future oil spills within the range of the murrelet; (3) developing a dialogue with the Department of Commerce about minimizing the risks of oil spills (e.g., modifying shipping lanes, requiring double-hulled tankers); and (4) developing a dialogue with the administrators of the State and Federal oil platforms about minimizing the risks of oil spills. I realize that the State of California has created the Office of Spill Prevention and Response (OSPR) and that OSPR funded studies to look into the potential impacts of oil development and oiling of seabirds (Page 25), however given the potential for a large oil spill and the potential for a severe impact on the Xantus' Murrelet population, specific recommendations should be addressed in this report and in future discussions about this species to identify priorities and concrete rules or strategies for preventing an oil spill within the range of the murrelet.

Comments on specific sections of the report are as follows:

Page 10, first paragraph: this paragraph needs to be more clear about the historical information and the historic status of the population. Is there more than one conclusion that can be drawn from the historic information? Perhaps beginning the paragraph with a sentence similar to that on page 16 at the top of the Anacapa Island trend information might be helpful to clarify CDFG's overall thoughts about this information. To me the impacts of the introduction of non-native mammal on populations of the Xantus' Murrelet seems clear and straight forward.

Page 10, last paragraph: Was the 1959 fire on Santa Barbara Island human caused? This is implied but not stated.

Page 11. Although your focus on Santa Barbara Island is appropriate here, I think adding a table that outlines all the effects of humans on all the islands would be helpful to the reader (something similar to Table 2 in the petition).

Page 15, top: Make it more clear here why occupancy rates are not declining at the Cat Canyon site. If cover is declining and not occupancy rates, then the cliff/crevice habitat types must provide the necessary cover for this species. Is this the case? If so please add more details to explain this to the reader.

Page 15, first full paragraph: reword the statement "unexplainable as a natural pattern". This is confusing as written.

Page 18. The population trend section focuses on information from Santa Barbara and Anacapa islands. Is there additional information on the populations of the other islands that could be included here?

Pages 35-36. This section on oceanographic and prey changes does not discuss in detail the potential impacts of overfishing on the murrelet. More details should be added about the kinds of fishing pressure that occurs within the range of the murrelet, including a list of the various fisheries and their potential impact on the diet of the murrelet.

Page 46, first paragraph, first sentence: delete "with a substantial loss in breeding habitat". This does not seem to fit here as there are other reasons for population declines of this species on Santa Barbara and Anacapa islands.

Pages 48 and 49. It should be mentioned that this list of recommendations and proposed research projects is not complete and that the interagency team and team of experts will likely develop additional recommendations and research projects in the future as needed for management and to ensure the survival and recovery of this species.

Pages 49-51. As discussed above, add a bullet about developing a plan to minimize oil spills within the range of the murrelet.

Table 1. Were confidence intervals of the population estimates presented in the cited papers? If so they should be added here.

I hope you have found my comments useful to your revision of this document. Please contact me if you have any questions or need clarification on any of my comments.

Sincerely,

S. Kim Nelson
Oregon State University
Department of Fisheries and Wildlife
104 Nash Hall
Corvallis, OR 97331-3803



United States Department of the Interior

U.S. GEOLOGICAL SURVEY
BIOLOGICAL RESOURCES DIVISION
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1011 E. Tudor Road, MS 701
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IN REPLY REFER TO:

November 8, 2003

Esther Burkett
Department of Fish and Game
Habitat Conservation Planning Branch
1416 Ninth Street
Sacramento, CA 95814

Re: Status Review of Xantus's Murrelet

Per your request, I have reviewed the draft Report to the California Fish and Game Commission that provides an assessment of the status of Xantus's Murrelet populations in California, and makes recommendations for its conservation.

I concur with the Department's conclusion that the listing of Xantus's Murrelet as a threatened species is warranted. Population size is small and of similar size to other rare and vulnerable seabirds of the North Pacific, including other alcids such as the Japanese Murrelet (which is protected as a "National Monument" in Japan) and the Kittlitz's Murrelet (recently petitioned for Federal protection, and currently under review by USFWS). Data provided in this report provide compelling evidence for continuing and significant population declines of Xantus's Murrelet. A variety of threats— both observed and potential— suggest that population declines will continue without some action to mitigate those threats. Taken together, evidence that Xantus's Murrelet in California have small, declining and threatened populations is sufficient to warrant immediate action by the Department in protection of the species.

The review of biology, population status and threats presented in this report appears to be quite thorough and adequate to make a judgment on the status of this species. Indeed, there are information presented here which are not reported elsewhere, and it appears that a good effort was made to compile and integrate all available information before assessing the status of the species. I have no problems with the data presented herein, or any of the main conclusions drawn from results presented here or elsewhere. I have some concern about conjecture on the magnitude and impact of anthropogenic threats to populations. The true impact of *potential* human threats may be much less, or, much greater than the data are able to currently demonstrate one way or the other. This is clearly an area that needs further research and documentation.

Attached are some specific comments on sections of the report. Most of these relate to minor issues or questions that could, perhaps, be addressed differently. I found no problems that would substantially change the conclusions or recommendations of the report.

If I can be of further assistance, please do not hesitate to contact me.

Sincerely,

John Piatt, Ph.D.
Research Wildlife Biologist
U.S. Geological Survey

Attachment:

Comments on the Executive Summary—

I would be as accurate and conclusive as possible in this section because this is all the text that many people will read.

P2. Life History, 1st para. "... where few ground dwelling predators exist" is understating the need for predator-free habitat. It would be more appropriate to say: "With few exceptions, alcids must nest on offshore rocks or islands where adult birds are free from persecution by natural terrestrial predators such as rats, weasels, foxes, etc."

P3. Life History, 4th para. "A conservative estimate of decline is 30 percent...". This statement should be qualified. Given the differences in methods used, and effort made, to estimate populations in the 1970s versus the 1990s, the data are not strictly comparable. Further, the data on occupancy suggest much greater declines during the past 15 years alone. I would say "A conservative estimate of decline is 30 percent, from... .. in 1991. The true magnitude of decline is probably greater because early attempts to census populations were likely incomplete."

P3. Life History 5th para. Given change suggested above, this para. might start with "In support of this, murrelet occupancy rates at National Park Service (NPS) nest monitoring plots on Santa Barbara Island have declined markedly during the past 15 years alone, in some case by up to 70% (range 30-70%). "

P3. Threats. Oil Pollution. The relative lack of observed mortality events should not preclude a strong conclusion about their vulnerability. I would open this section with: "Like all other alcids, Xantus's Murrelet are extremely vulnerable to oil pollution because— in contrast to more aerial species such as gulls and terns— murrelets spend most of their time at sea swimming on the ocean surface, which is where oil pollution is concentrated."

P4. Artificial Light Pollution. I think the most significant problem with light pollution is the immediate attraction and injury of adults (more about that below). You should insert the following up front to reflect priority concerns: " Murrelets, like many other nocturnal seabirds, are attracted to lights at night. Once attracted, the blinding lights often cause birds to collide with the vessel. In turn, this may cause immediate death, or more commonly, injuries or contamination on board that leads to later death at sea after escape or release by humans. Small amounts of vessel lighting... etc."

P5. Recommendations.

You should spell out each recommendation separately. Your second recommendation is actually two different recommendations. Your third recommendation is redundant to some degree with your second recommendation. Again, because the Executive Summary is all the text that many people will read, or at least refer back to regularly, your Recommendations here should be clear, unambiguous, and perhaps prioritized. May I suggest the following, using numbers to indicate priority:

"The Department makes the following recommendations in order of priority:

- 1) The Department recommends that the Commission add Xantus's Murrelet immediately to the list of threatened species.

- 2) The goal of the Department should be to stop and then reverse the current decline in populations of Xantus's Murrelets in California.
- 3) A recovery team composed of experts drawn from appropriate state, federal and private agencies, and NGOs, should be established quickly to accomplish recommendation #2. Action should not be delayed while waiting to create an ideal recovery team; an initial team should be established to get the process moving.
- 4) A number of management recommendations for recovery and conservation are outlined in this status review report, but a clear and overarching recommendation is that we need to protect and/or enhance existing nesting colonies and the marine environments surrounding them to ensure continued existence of the species.
- 5) The recovery team should, with minimal delay, prioritize and implement management recommendations identified here, and as developed over time by the recovery team. “

Comments on main body of Status Review

P2. Life History. Para. 1. I guess I would not call “alcids” a short-hand term, rather it is the accepted term for family Alcidae. Just cut this sentence.

P3. Life History. Para.2. Don't know latest records, but common murre known to live to at least 26 years in the wild.

P3. Life History. Para.4. I have always understood that nest site fidelity refers specifically to re-use of the same nest site, not just return to the same colony (which you correctly refer to philopatry).

P3. Life History. Para.6. Discussion of diurnal pattern turns into annual pattern of attendance then into timing of breeding. Split into 3 paragraphs.

P4. Life History. Para.12. Not critical, but perhaps best reference for taxonomic relations is: Friesen, V.L., A.J. Baker, and J.F. Piatt. 1996. Phylogenetic relationships within the Alcidae (Charadriiformes: Aves) inferred from total molecular evidence. *Molecular Biology and Evolution* 13:359-367.

P4. Life History. Para.12. Not sure I would agree that Ancient Murrelets “have been well studied for many years”, at least any more so than Xantus's. Both species are known mostly for observations at single sites, and both remain relatively enigmatic owing to nocturnal habits and brief chick-rearing periods. I think we know a lot more about foraging behavior, diet and post-breeding dispersal of Xantus.

P7. Range and Distribution. Other factors... The experience in Alaska and British Columbia with foxes is well documented, and shows that they have a major impact on the ability of ground-nesting seabirds to survive on islands where foxes are present (see Bailey and Kaiser 1993, The status, ecology and conservation of marine birds of the North Pacific).

P8-14. Population Trend. You rightly spend a lot of time on this. However, I would argue that to some degree, the debate about accuracy of early censuses by Hunt et al. and Murray et al. are distracting, and not particularly compelling. Unless methodologies were extremely well-documented (which they were not, or we would not be having this debate), it is always a problem going back to old census reports and trying to reconstruct what investigators were thinking when they came up with estimates and why their estimates changed between years/reports in the absence of any new data. You may just as well summarize the whole affair by saying "The average of three point estimates produced in 1979, 1980 and 1983 was about 5700 birds (Table 1). " Further, to then agonize over the absolute trend is also not warranted because Carter et al. used different methods, and if anything, were much more painstaking in their quest to document Xantus, and include offshore islands and rocks in their estimate. Their 2002 estimate in particular may represent an increase from 1992 in survey effort rather than bird population. In any case, any comparison between Hunt and Carter would likely underemphasize the size of the decline.

You have indicated in your summary the many uncertainties associated with the data sets and the trends. Your uncertainty, however, may extend to a gross underestimate of the decline as well as a gross overestimate. Rather than saying (in Executive Summary, above) that you propose a "conservative estimate of 30% decline", you may be better served by taking the historical reports at face value and saying something like "Historical censuses conducted by Hunt et al. in the late 1970s are reported ambiguously, and it is not clear how valid a comparison may be made with later censuses by Carter et al., but it appears that the population may have declined by 51% (3180 to 1544) to 81% (8000 to 1544) by the early 1990s. Declines would be slightly less (45% to 78%, respectively) if we used Carter's 2002 estimates".

P.14. Nest Site Occupancy. Succinct and compelling summary. Now, estimate the annual rate of decline from the data. I did this working from the raw data graphed in Figure 10a, and estimated an approximate rate of annual decline of -6.8% and -3.6% per annum at Nature Trail and Cat Canyon plots, respectively. This suggests an average decline rate of -5.2% per annum, i.e., very similar to Sydeman's high estimate for rate of decline from the 1970s to 1990s. Please, make the estimates using actual data and tell us what they are.

P.14. Productivity measures. The differences among species are not that outstanding. In Alaska, I can point to much larger and consistent differences in productivity *among adjacent colonies of the same species* (e.g., Kittiwakes)! Local food supply alone is sufficient to explain such differences. Add differences in rates of egg predation (surely a factor here), climate, adult disturbance, and annual variability and these differences are easily accounted for. I would definitely remove the statement that "differences should be more closely aligned... etc."

P. 19. Population Trend Summary. I think you should modify this, per comments above. I would have to strongly disagree with your conclusion that "since all researchers had this same difficulty, any biases associated with the methods were likely consistent across studies and years...". Without very detailed documentation, it is next to impossible to say how comparable the efforts were. I would agree that estimates are likely correct within an order-of-magnitude (10 fold), but would guess that accuracy is less than plus or minus 50%. Even for conspicuous, easily monitored, diurnal species (e.g., common murres), we have difficulty detecting statistically meaningful differences of plus or minus 20-30% among years. I don't mean to suggest the whole-colony counts are wrong... rather, the changes could be even greater than your summary suggests! It is interesting data, and worth discussing, but the 19 year time series of plot data are much more compelling and worthy of emphasis.

P.23-40. Major Threats. These sections are pretty well fleshed out, with lots of detail. Just a few comments:

P.26. Barn Owl. Seems to me that this predator could be having a major impact on Xantus's populations. Despite it being a "natural" predator, shouldn't there be some consideration for hazing, reducing or otherwise eliminating owls on Santa Barbara, at a minimum to study whether owls, by themselves, could account for the declines.

P. 31-34. Artificial Light Pollution. A thorough review. However, it is nowhere stated explicitly what happens to birds attracted to vessels, except that they may get exhausted flying around, or die in a direct impact on some vessel structure. I agree that both of these phenomena occur, but it is hard to quantify either. What does occur regularly is that birds—commonly adult and juvenile alcids, and particularly nocturnal auklets and murrelets—are attracted to vessel lights, flutter around the vessel until, blinded, they fly into some hard structure and fall to the deck. In rare instances they may be killed instantly. Most often, however, they may be stunned momentarily, or merely disoriented. This is where problems often begin. Now finding themselves on the deck, sheltered from winds, and unable to get airborne and fly away, they may wander around until they find themselves trapped in some corner or cubbyhole (often under some equipment, chains, tarps, boxes, etc.). Here they may stay until next morning, when deckhands working outside discover them and, perhaps, release them overboard. The problem is that at this point they may be exhausted, wet to the skin, hungry and weak, and even contaminated by oil products so commonly found on vessel equipment. Now released in broad daylight, their odds of survival are much reduced as first, they must escape diurnal predators, and second, try to dry out their plumage quickly before hypothermia and/or starvation drain their reserves completely.

My point is that mortality from attraction to lights on ships at sea is probably much higher than imagined by causal observers. In my experience, dozens and dozens of birds may be trapped and hidden from view the morning after a night-light event brings birds aboard. Without a thorough search, nobody—scientist or captain alike—is likely to know the full extent of the damage. Further, if birds are not cleaned and dried before release, I have doubts about their ability to survive afterwards. In my opinion, if bright lights—even "shielded" lights—are being used routinely at sea in close proximity to colony sites ashore, then the potential for artificial capture and subsequent mortality is very high. This needs careful documentation.

P.35. Oceanographic and prey changes. I see that this is listed under "minor threats". Evidence for long-term, cyclical changes in marine ecosystems of the North Pacific are widespread and compelling, and strongly suggest that a wide variety of marine birds have been negatively, or in some cases, positively affected. I would be surprised if Xantus's were not affected to some degree as well. Indeed, effects of changes in food supply could be an over-riding force affecting their populations, and should not be discounted. Any attempt to assist in the recovery of populations may be restricted if not doomed by ecosystem constraints. This is a critical research need.

Report on "Status Review of Xantus's Murrelet"

I have read this report and found it to be thorough and complete, to the extent of my knowledge of the literature relevant to this and closely related alcid species in the context to which this review is being undertaken.

This report adequately identifies the areas of concern regarding the present status of the Xantus's Murrelet: the species' current rarity i.e., small size of the world's population of the species, and its recent and continuing decline; its restricted distribution, especially during the breeding season; the rearing of precocial young at sea, and the vulnerability of these young to oil spills; its vulnerability to predation on the nesting islands, etc. Indeed, the Xantus's Murrelet is one of the rarest seabirds in the North Pacific Ocean and because it is in trouble, it should receive the special attention sought by the present petition.

Page 4, paragraph 1: The typical clutch size of alcids is one egg. Indeed, species in only two alcid genera lay two eggs, including Xantus's Murrelet.

Page 4, paragraphs 2 and 4: Although the act of departure from the nests by young Xantus's Murrelets was mentioned in the review, it should be emphasized that because the precocial and, hence, downy young leave their nests at 1-2 days of age, and flightless, they are extremely vulnerable to oil spills at this time when being led away from the colonies by the adults. What is the tanker traffic like during this stage of the Xantus's Murrelet breeding season? (This is also relevant to the section on oil pollution on page 24.) The vulnerability of Xantus's Murrelets to oil spills otherwise is solidly documented. The SOWLS et al. (1980) report was cited and the occurrence of flightless hatchlings near the colonies was indicated. What about the period of flightlessness of adults during the adults' prebasic molt, when they simultaneously drop their flight feathers? Where are they during this vulnerable time? Are they thinly dispersed over throughout the winter range? Are they clumped or aggregated and, hence, vulnerable to an oil spill? Probably not, but little is known about the distribution of individuals in the winter, and in view of the broad range of ocean on which the species ranges in winter (Figure 5), it may be assumed they are thinly dispersed over this range.

Page 7-8: The authors' attempt in the present report to determine and compare historic and present numbers of Xantus's Murrelets, particularly on Santa Barbara Island but also at other colonies, is thorough and unbiased. I agree with the results of the assessment here. Compared with the anecdotal accounts of early ornithologists in the early part of the 1900s, the decline and current rarity of the Xantus's Murrelet is real and is of concern. In an ideal world, we would like to be able to count every bird, every few years, and thus without doubt know the trends in population size. However, Xantus's Murrelets are extremely difficult to study and survey (even more difficult than many other alcids), but some surveys have been conducted and the authors of the present report summarized and interpreted these data realistically and conservatively and still pointed to a

decline in the number of murrelets in recent years. This trend was supported by data on nest occupancy (the high degree of nest-site fidelity makes this method appropriate) and productivity. Productivity of Xantus's Murrelets on Santa Barbara Island is unexplainably lower than that determined for other precocial murrelets. Are most nests losing at least one egg to predators, perhaps the first egg that is left unattended for so many days before the second and final egg of the clutch is laid? This is a cause for concern and I wonder whether placement of artificial nest sites, i.e., nest boxes, in the habitat would help increase productivity, over a short-term period, and possibly the number of breeding pairs, over time. This has undoubtedly been considered (yes, I see on at least page 52).

Page 9, paragraph 2: I am glad to see Drever's work cited here. It confirmed that the closely related Ancient Murrelet figured importantly in the diet of introduced rats on Langara Island (Queen Charlotte Islands, British Columbia) and that rat predation on eggs/nestlings and adults was implicated in the decline of that murrelet species. The recent success of the rat eradication program on Langara Island and other islands perhaps should be brought into the present report (only time will tell whether and to what extent Ancient Murrelets will return as a breeding species on that island). There is good reason for optimism, however, because the removal of rats from Langara Island removed an important source of both egg/nestling and adult mortality. Reducing mortality on the adults only is not enough, as Sydeman et al. pointed out. (See also page 23, paragraph 3, where the Langara Island rat eradication program might also be mentioned.)

Page 19, paragraph 3: I agree.

Page 20: sound arguments based on previous scientific findings.

Page 30, paragraph 3: There is evidence emerging that some prey species (and hosts of some avian brood parasites) retain anti-predator behaviors in the absence of a current selection pressure, i.e. current predation by a particular predator.

Page 33, paragraph 3: Would it be possible to ban squid fishing near Santa Barbara Island during the murrelets' breeding season? Politically, probably not. Do squid boats land their fish on Santa Barbara Island or return to the mainland to land them? Probably the latter. Thus, the waters off SBI are just good places to catch squid? More research is needed on the influence of lights on murrelet mortality. Light pollution seems to be an important problem in the conservation of the murrelets.

Page 36, paragraph 1: I agree. One of the highlights of my findings on the prey species taken by Ancient and Marbled murrelets off the OCI was each species' ability to switch to new prey species as they became available (Sealy, Can J. Zoo. 1975). Both species fed on zooplankton and larval fish and it appears this

range of prey species is similar in Xantus's Murrelets. The array of species taken by Xantus's Murrelets, despite small numbers of stomachs examined overall, indeed, suggests opportunism in prey use.

Page 40, paragraph 1: Losing a few Xantus's Murrelets and/or their eggs and chicks, even here and there, to owls, mice, falcons, gill nets, collisions, oil, etc. adds up when the murrelet population is already low. Beebe's and Nelson's documented use and numbers of Ancient Murrelets taken by Peregrines would give you cause for concern, in addition to your observations on this species taking Xantus's Murrelets.

Page 45, paragraph 3: Each of these threats is documented thoroughly on the basis of the available information.

Page 46, paragraph 1: If reproductive productivity can be increased then there will be individuals that will need breeding sites for themselves. They will seek sites that are not already in use by their parents. The key is for greater production of young to be achieved.

Page 50, point 2: how widespread was the Loggerhead Shrike on the Channel Islands? Has it been extirpated from any islands where Xantus's Murrelets and deer mice presently occur? Perhaps shrikes historically controlled the mice.

Page 53, paragraph 2: I agree.

The recommendations are based on solid and realistic interpretations of the available data.

S.G. Sealy, Department of Zoology, University of Manitoba, Winnipeg, MB R3T 2N2, Canada.

November 8, 2003